

NIOSH ANNUAL REPORT

THE UNIVERSITY OF MICHIGAN
Education and Research Center for
Occupational Health and
Safety Engineering

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Submitted by:
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SECTION I

ERC Summary

Since inception in 1982, the University of Michigan Center for Occupational Health and Safety Engineering (COHSE) has provided comprehensive graduate-level educational programs to aspiring practitioners and researchers in Industrial Hygiene (IH), Occupational Health Nursing (OHN), Occupational Safety Engineering (OSE), and Occupational Epidemiology (OE) to help meet the nation's needs for qualified professionals. Our academic programs are complemented with our highly effective Pilot Project Research Training (PPRT), Continuing Education (CE), Outreach, and Research-to-Practice Programs.

Our success as a center of excellence is predicated on (1) an outstanding and dedicated faculty; (2) interdisciplinary curricula that prepare our graduates for modern practice; (3) vibrant extramurally funded research programs in many NORA-related areas that train next-generation research leaders; (4) multifaceted outreach and CE programs that meet the needs of professionals in our region and beyond; (5) strong institutional support; and (6) active and engaged alumni, many of whom are leaders in their fields.

Highlights of the past year (2013-2014) include: one new faculty hire in OSE; numerous scholarly publications by faculty and students; new courses on core and special topics, including an interdisciplinary case-based course; research fellowships that recruit students from other disciplines to NORA-relevant research; and a Visiting Partners Program that links regional health and safety professionals with ERC faculty. During this period, 71 graduate students were enrolled, and 34 masters and 10 doctoral degrees were awarded. Nineteen classroom-based CE programs were attended by approx. 900 participants and an additional 24 one-hour webinars were attended by over 12,000 participants. Six Pilot Research Projects were funded. Goals for the next 5 years include: (1) continuing to enhance our curricula to meet evolving training needs; (2) increasing enrollment in all programs; (3) augmenting ERC financial support for trainees; (4) initiating new program specialties to expand our impact; (5) continuing to offer high quality CE courses and events; (6) increasing alumni engagement in recruitment and career placement; and (7) maintaining research programs at the cutting edge of occupational health science.

Relevance

The US workforce carries a disproportionate burden of preventable job-related morbidity and mortality. By training high-quality practitioners and researchers, the Michigan COHSE helps to meet critical shortfalls in health and safety services in most small and many larger workplaces, and thereby reduces the incidence and severity of occupational injury and illness.

Key Personnel

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SECTION II – Program Highlights in 2013-2014

Industrial Hygiene

- Job-Exposure Matrix Database and Tool. **Richard Neitzel**, PhD, Assistant Professor of Environmental Health Sciences, was awarded an R21 grant from NIOSH to develop and disseminate a job exposure matrix (JEM) for noise for all US and Canadian industries. The primary study outputs will be a national noise JEM, a complementary web-based JEM tool, and several peer-reviewed articles describing the use and impacts of the study on worker hearing conservation efforts. The study focuses on the translation and dissemination of existing knowledge to relevant end users (i.e., occupational health researchers and practitioners) for implementation in both workplace and research settings. This focus aligns very well with the on-going NIOSH initiative.
- Assessing Control Technologies for Construction Workers. **John Meeker**, ScD, Associate Professor of Environmental Health Sciences, continues to work with the Center for Construction Research and Training (CPWR) in assessing the effectiveness of local exhaust ventilation (LEV) systems for protecting workers from exposure to welding fume and respirable silica in construction, and improving the adoption of LEV on job sites. He presented up-to-date results from a study comparing commercially available LEV for controlling welding fume at the annual AIHCE conference in San Antonio, TX, in June, 2014. He has now written technical reports on three such LEV systems that have been condensed into simple 1-page brochures for dissemination to contractors and the trades in an effort to enhance awareness and adoption.
- Study of Paper Mill Workers. **Richard Neitzel** was a visiting scientist at the University of Gothenburg's Occupational and Environmental Medicine unit at Sahlgrenska Hospital in Gothenburg, Sweden in the summer of 2013. He provided guidance on exposure assessment and occupational hygiene for a study of cardiovascular disease among paper mill workers, as there are no academic occupational hygiene training programs in Sweden.

- Biomonitoring Technology Development. **Edward Zellers** was awarded a 2-yr, \$100,000 seed grant through a highly competitive program between the University of Michigan (UM) and Shanghai Jiao Tong University (SJTU) that supports collaborative research aimed at developing new technologies that 1) reduce global carbon emissions and climate impact, and 2) develop biomedical technologies to promote human health. Prof. Zellers will be working with Assoc. Prof. Zhongyu Hou of the SJTU School of Electronic, Information, and Electrical Engineering on a project entitled “Nano-Enabled Multi-Transducer Arrays in Microsystems for Point-of-Care Breath Biomarker Analysis,” aimed at improving technologies capable of on-site determinations of breath biomarkers of exposure and disease among workers and the general population.
- Wearable Exposure Monitoring Instrumentation - Personal Exposure Monitoring Microsystem (PEMM). **Edward Zellers** was awarded an R01 grant from NIOSH-CDC to develop and characterize a wearable gas chromatographic microanalytical system (μ GC) for near-real-time recognition and quantification of the components of complex mixtures of volatile organic compounds (VOC) encountered in working environments. The proposed μ GC, referred to as a Personal Exposure Monitoring Microsystem (PEMM), will be battery operated, autonomous, and small/light-weight enough to mount on the belt of a worker, yet capable of personal exposure measurements of at least 10-15 specific, user-selectable VOCs every 10-15 minutes in a complex matrix of background VOCs. No such instrumentation currently exists. This project involves several NIOSH trainees and addresses one of the strategic goals in the NIOSH Exposure Assessment Cross Sector and will also have impact on the Emergency Preparedness and Response Cross Sector. It will engage a private-sector business to build the prototypes and facilitate commercialization, and local stakeholders and NIOSH researchers to devise mock field-test scenarios responsive to various specific workplace exposure hazards.
- Guarding Against Terrorist Threats - Trace-Level Explosives Detection Technology. **Edward Zellers**, along with several NIOSH-supported trainees, co-authored an article published in the journal *Analytical Chemistry* entitled “Microfabricated Gas Chromatograph for Rapid, Trace-Level Determinations of Gas-Phase Explosive Marker Compounds”. It describes the first instance of a complete prototype instrument for gas-phase explosive marker compounds that relies on a fully-microfabricated gas chromatograph (μ GC) for analysis. Funded by the U.S. Department of Homeland Security, a distinguishing feature of the work is its focus on microsystem integration for selectively determining explosives at ultra-low concentrations in complex mixtures in < 2 minutes.
- Underserved Populations -- Immigrant Farm Workers. **Richard Neitzel** co-authored articles published in the *Journal of Agromedicine and Workplace Health and Safety* on his collaborative studies of a vulnerable and underserved population of agricultural workers (i.e., Hmong immigrants) in the United States. These articles describe the first research done on this group, and they have important translational ramifications for insuring that this population has access to adequate occupational health services.

Occupational Epidemiology

- **Marie O'Neill** gave a talk as part of the featured National Climate Assessment Panel (June 24, 2014) at the 'Adaptation in the Great Lakes Region Conference,' in Ann Arbor, MI.
- **Marie O'Neil** joined the board of the Detroit Community-Academic Urban Research Center, taking the place of Professor Jerome Nriagu after his retirement.
- **Laura Rozek** was promoted to Associate Professor (effective September 2014) and appointed as Associate Director of the Office of Global Health in the UM School of Public Health.

Occupational Health Nursing

- Program student enrollment and graduation continues to grow. The Program admitted four new students in 2013, with 17 students enrolled during the reporting period. We graduated 7 M.S. students in the past year, and all are employed in occupational health positions in academia or clinical practice. The OHN-specialist program, preparing OHN managers, suspended admissions due to low enrollment. The OHN concentration for AGNP and FNP students continues to accept new applicants.
- The OHN Program faculty are engaged in research promoting and protecting the health of high-risk workers in agriculture, health care, and construction.
- **Marjorie McCullagh**, Associate Professor of Nursing and OHN Program Director, was selected for induction into the American Academy of Nursing.
- Hearing Protection among farmworkers and rural youth. **Marjorie McCullagh** continues her translational research to encourage use of hearing protection. Her pilot test of a novel educational program for farm and rural youth to prevent noise-induced hearing loss resulted in favorable changes in knowledge and behavior.
- Protecting oncology nurses. **Christopher Friese** and **Marjorie McCullagh** are collaborating on a NIOSH-funded randomized controlled trial to improve oncology nurses' protective equipment use.
- **Marjorie McCullagh** is also serving as a Director for the National Hearing Conservation Association. In collaboration with NIOSH, NHCA selects the Safe in Sound awardees, publishes leading articles in hearing conservation in the International Journal of Audiology, and holds an annual conference featuring leading investigators and clinicians in hearing conservation research and practice. Dr. McCullagh participated in an NIH/NIDCD review panel in 2014, providing critical review and recommendations for applications for NIH funding related to access to hearing health care.

Occupational Safety Engineering

- OSE students continue to receive external support and recognition. For example, NIOSH trainee Yadrianna Acosta-Sojo won a National Science Foundation Graduate Research

Fellowship (NSFGRF) during the 2014 competition, joining NIOSH trainee Denny Yu and OSE student Brandon Pitts who were NSFGRF winners in previous years. Brandon was also recognized by the College of Engineering with the Distinguished Leadership Award for outstanding service to the College, University, and Ann Arbor community.

- New faculty. **Clive D'Souza** joined the faculty in September 2013 as an Assistant Professor. He received his Ph.D. in Industrial and Systems Engineering from SUNY-Buffalo where he also received a M.S. degree in Mechanical Engineering. He will use his broad engineering and ergonomics background to direct student research and develop new graduate courses in a variety of areas, including: Biomechanics, Applied Anthropometry, Rehabilitation Engineering, and Vehicle Ergonomics. In addition, he will teach our undergraduate ergonomics course (IOE 333).
- **Donald Chaffin**, Professor Emeritus of Industrial and Operations Engineering and the former Center Director of the Michigan ERC, was elected a Fellow of the American Society of Biomechanics.
- **Yili Liu**, Professor of Industrial and Operations Engineering, was elected Chair of the Human Performance Modeling Technical Group of the HFES Society.
- **Matthew Reed**, Research Scientist in the Center for Ergonomics, won the Huang Shilin Memorial Award for Distinguished Paper on Vehicle Safety, awarded by SAE China in 2013.

Continuing Education

- The UM COHSE Continuing Education Programs attracted 13,147 individuals and this resulted in 28,777 person-days of training to our programs. Attendance increased markedly due to co-sponsorship of 24 webinars in the fields of occupational health nursing, safety and ergonomics.
- New course. Protecting the Caregivers – Preventing Injuries in Long Term Care Facilities, attracted 66 attendees and focused on various aspects of reducing musculoskeletal disorders among health care and long term care providers. Michigan OSHA staff assisted with planning and marketing the program. Attendees were from local and regional health care facilities, government agencies and companies that provide safety services.
- The 50th Annual Warren Cook Discussional on Industrial Hygiene was conducted in October 2013. To celebrate the longevity of this program, additional events were added to the Discussional. The history of industrial hygiene was reviewed at an evening event and Dr. **John Howard** provided a seminar titled, "NIOSH and the Health of the Workforce: The Next 40 Years," for the Discussional attendees and the community of researchers and public health professionals in southeastern Michigan.
- The Michigan NORA Symposium, has different topics each year. In April 2014 the symposium focused on "Total Worker Health," and was conducted as part of the Michigan Safety Conference. The first symposium presentation by Dr. **Chosewood** from

NIOSH was also the conference keynote address. The keynote address attracted more than 225 attendees and focused on combining company health and safety initiatives with other activities to improve worker health.

Outreach

- A large number of program outreach activities were undertaken by UM Center faculty and staff, including curriculum and research assistance to other academic institutions, professional consultation, Toxic Tour of Detroit, and the publication of seminars on websites open to the public.
- Additionally, the Risk Science Center at the University of Michigan provided evidence-based information on human health risks and has developed a series of Risk Bites YouTube clips to provide 3-5 minutes of education on current health risk topics. Six Risk Bites videos were selected for a two-year exhibit at the National Academies of Science Koshland Science Museum in Washington, D.C. The selected videos are part of the Museum's Idea Lab, which focuses on building resilient communities that work together to understand hazards and prepare for, absorb, recover from, and adapt to adverse events. The selected videos on display, which range from "Hazard vs. Risk: The Same Difference?" and "Risk and Feeling," are an interactive way for visitors to understand how resilience relates to their lives and communities.
- **Stuart Batterman** briefed the Senate Energy and Public Works Committee in February 2014 regarding health impacts of tar sands production and refining.

Pilot Project Research Training

- In the 2013-2014 project period, we received eight proposals, including proposals from investigators at the University of Michigan School of Public Health, University of Michigan School of Engineering, and Purdue University. Six were selected for funding.
- Funded PPRT projects resulted in a number of published papers in conference proceedings and peer-reviewed journals, and at least two follow-on proposals to NIOSH and other federal funding agencies for R21 or R01-level studies.
- The internet presence of the PPRT program has been enhanced, and our marketing efforts have been expanded to increase the number and scope of PPRT applications in coming years. We anticipate that these applications will come from a broader range of universities as well as professional disciplines.
- Center Director **Stuart Batterman** obtained follow-up funding for research addressing the use of bloodspots for occupational and environmental monitoring of semivolatile organic compounds including PCBs, PBDEs and Pesticides, and published this research in the journal *Science of the Total Environment*.

Research to Practice (R2P)

- The Visiting Partners Program continues to sponsor collaboration between mid-career professionals, who focus on occupational health and safety, faculty and professionals at The University of Michigan. Examples of VPP projects completed during the current reporting period are given below.
 - **Beth Lamanna**, RN, MPH, Clinical Assistant Professor, University of North Carolina at Chapel Hill completed a project that addressed the responsible disposal of unused pharmaceuticals in order to keep active pharmaceutical ingredients (APIs) out of the waste stream, etc. Her project lead to the development of guidelines that can be used by health professionals and community members to develop local policies, implement responsible disposal practices, and educate others on the issue. Beth has given presentations on the issue at public health conferences, publishing articles and commentary in nursing journals, and educating and mentoring nursing students to be active in this area.
 - **Chad Positano**, Compliance Assistance Specialist, U.S. Dept. of Labor, OSHA, completed a project which involved developing a compliance manual for biofuel producers intended for use by the numerous but smaller producers that do not have the resources that major producers do for addressing compliance with OSHA workplace safety standards. Chad's compliance manual has passed local and regional approval and is awaiting final approval from the national OSHA office, after which it will be published for use throughout the U.S.
- The Center for Ergonomics released an iOS version of the University of Michigan Three-dimensional Static Strength Prediction Model. This software is widely used throughout the world to evaluate strength requirements and biomechanical strain resulting from manual work. The new release allows the program to be run on iPhone and iPad platforms.
- **Stuart Batterman** served on the State of Michigan Department of Environmental Quality Task force developing streamlined methods to assess risks of vapor intrusion on contaminated properties and buildings.